Evaluating the effect of strengthening nurse midwifery pre-service education in two Indian states: A single group pre – and post – intervention study

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ABSTRACT

Background: The high focus states of India have higher maternal and neonatal mortality rates as compared to the national average. The quality of pre-service education (PSE) in nursing midwifery institutions in these states was found to be suboptimal. In 2013, Government of India implemented the PSE strengthening program across all public sector nursing midwifery institutions. The program focused on strengthening educational processes, training infrastructure, institutional management and clinical site practices by implementing a set of performance standards.
Objective: To evaluate the effect of PSE strengthening program on institutional performance and maternal neonatal health (MNH) related competences of nursing midwifery students and faculty.
Design: Single group pre-post intervention study.
Settings: 15 sampled public sector nursing midwifery institutions in the states of Madhya Pradesh and Odisha, India.
Participants: Final-year students and faculty involved in teaching MNH subjects.
Methods: Performance of 15 sampled institutions was assessed at baseline, midline and endline using the performance standards. Additionally, competences of 232, 295 and 298 students and 64, 62 and 63 faculty members at baseline, midline and endline respectively were assessed on six MNH related practices using objective structured clinical examination (OSCE).
Results: None of the institutions met 70% standards during baseline. At endline, 13 of the 15 institutions met these standards. The mean OSCE scores of students and faculty at baseline was 17.1 (SD: 8.0) and 23.5 (SD: 14.3) out of 76 respectively. It significantly increased to 66.4 (SD: 8.0) and 71.1 (SD: 5.2) during the endline. The proportion of students and faculty found competent (achieved 75% in OSCE) also significantly increased from none at baseline to 91% and 98% respectively, at endline.
Conclusion: The combination of attributes included in the PSE strengthening program may have contributed to improvements in institutional performance as well as MNH related competences of nursing midwifery students and faculty.

1. Introduction

The vast majority of maternal and newborn lives lost during pregnancy and childbirth can be prevented with quality antenatal care and the presence of a skilled nurse midwife during childbirth (UNFPA, 2014). Good quality midwifery services can avert key causes of maternal

and neonatal deaths, such as infection, post-partum hemorrhage, eclampsia, birth asphyxia, and pre-term birth, especially in developing countries (Renfrew et al., 2014; ten Hoope-Bender et al., 2014; WHO, 2014a).

In India, although the nurse midwifery cadre comprises around 38% of the total health workforce (Tiwari et al., 2013), there is still an acute shortage of more than 2 million nurse midwives (WHO, 2014b). The country follows an integrated pathway for pre-service training of nurse midwifery cadre. It includes a 3.5-year training, awarding a diploma of General Nurse Midwifery (GNM), and a university-based 4-year program, awarding a Bachelor's of Science degree in Nursing (B.Sc. Nursing) (Sharma et al., 2015). All the students who complete GNM and B.Sc. nursing courses are registered as Registered Nurse and Registered Midwife (Indian Nursing Council, 2019). Conversely, the students who complete a two-year training, are registered as auxiliary nurse midwives (ANMs) (Mavalankar et al., 2011; Indian Nursing Council, 2019).

In India, there is a skewed distribution of nursing midwifery institutions with only 9% located in government designated high focus states, which have high maternal and neonatal mortality rates when compared to the national average (Rao et al., 2011). The high focus states also referred as "Empowered Action Group (EAG)", are socio-economically backward states of India which have unacceptably high fertility and mortality rates as compared to the national average (GoI, 2011). The public sector nursing midwifery institutions which do operate in high focus states deliver suboptimal education mainly due to inadequate physical and training infrastructure, faculty shortage as well as reliance on poor didactic teaching methods (NHSRC, 2009; Rao et al., 2011).

In 2012, Government of India (GoI) launched a national initiative to improve the quality of pre-service education (PSE) for the nursing midwifery cadre. Jhpiego – an international health organization affiliated to Johns Hopkins University worked closely with GoI, Indian Nursing Council (INC) and respective state governments to strengthen the quality of PSE in public sector nursing midwifery institutions of four high focus states. This paper presents the findings from an evaluation aimed to assess the effect of the PSE strengthening program on institutional performance as well as maternal neonatal health (MNH) related competences (knowledge & skills) of nursing midwifery students and faculty. The evaluation was conducted in 15public sector nursing midwifery institutions of the states of Madhya Pradesh and Odisha.

2. The PSE strengthening intervention

The intervention was initiated in April 2013 and implemented across public sector nursing midwifery institutions in four high focus states namely Madhya Pradesh, Bihar, Odisha and Rajasthan. There were a total of 133 (28 in Bihar, 36 in Madhya Pradesh, 27 in Odisha and 41 in Rajasthan) public sector nursing midwifery institutions in these states. Jhpiego provided technical assistance to state governments in implementation and roll out of PSE strengthening program in their respective states.

The PSE strengthening process included improving educational processes, training infrastructure, management processes at institutions and strengthening clinical practice sites (hospitals) by implementing a set of performance standards (81 for colleges of nursing, 80 for GNM schools and 79 for ANM training centres) developed in consultation with GoI and INC (GoI, 2013) (Fig. 1). The GoI and INC set a benchmark of minimum 70% standards for qualifying an institution as capable of providing quality education.

To start with, a state level Technical Advisory Group with representation from the state government, nursing council and other development partners was constituted and oriented on the PSE strengthening initiative. Each intervention state was divided into three divisions with a Program Officer (nursing or medical graduate) of Jhpiego assigned to each division, who served as the program nodal person and provided institutional level supportive supervision. The performance standards were then implemented in all public sector nursing midwifery institutions.

Regular periodic assessments (every six months) were undertaken at all public sector nursing midwifery institutions to assess quality of PSE, identify gaps and monitor progress. The physical and training infrastructure of the institutions were upgraded to create an enabling environment for the nursing midwifery students. Access to well-equipped labs (skills lab and computer lab) and strengthening of attached clinical
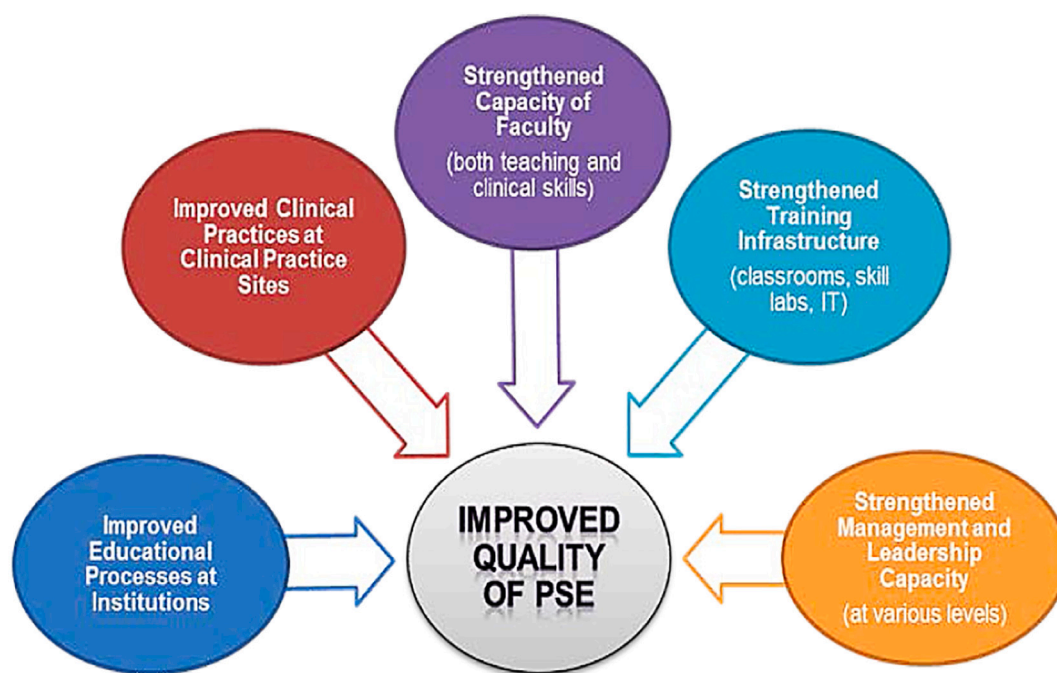

Fig. 1. Framework of PSE strengthening to improve the quality of nursing-midwifery education.
Full instrument available online at: http://nursingandmidwifery.gov.in/preservice/Operational%20Guideline-Final%20Compiled-Jan,%202013%202nd%20edition.pdf.

practice sites were ensured to promote competency based learning. Faculty of the institutions attended a specialized residential six-week training focused on improving their knowledge, facilitation and clinical skills on latest MNH practices.

The quality improvement approach focused not only on the competency development of students and faculty at institutions but also on improving knowledge and MNH skills of service providers (doctors & staff nurses) posted at attached hospitals where students go for clinical practice. This was done through organization of onsite skills standardization trainings for service providers posted at labor rooms of the attached clinical practice sites.

3. Methods

3.1. Study design

The data for this evaluation were collected from sampled nursing midwifery institutions in Madhya Pradesh and Odisha states. This study employed a single group pre-post evaluation design (Grimshaw, 2000; Eliopoulos et al., 2004) where MNH related competences of nursing midwifery students and faculty from sampled institutions were assessed using objective structured clinical examination (OSCE) method. This design has been used for evaluating nursing midwifery education related interventions in the past (Agrawal et al., 2016; Chan et al., 2009). Additionally, performance of same institutions were also assessed against predefined sets of performance standards (GoI, 2013). Baseline evaluation data were collected in the last quarter of 2013, midline data in the third quarter of 2015, and endline data in the last quarter of 2017 (Fig. 2).

3.2. Study sites and participants

This evaluation was conducted in selected nursing midwifery institutions of Madhya Pradesh and Odisha states. Of the total 63 institutions (31 ANM, 29 GNM, and 3 CoNs) in these two states, 15 (6 ANMTC, 6 GNM, 3 CoNs) were selected for this evaluation. Eligible participants included final year students who had completed their MNH coursework and faculty who were directly involved in teaching MNH courses to final year students. All students who participated in the assessment were females between 17 and 30 years of age, as per the admission criteria prescribed by INC (2019). Similarly, all nursing faculty who participated were also females having the required qualifications and experiences (B.Sc. nursing degree with minimum 2 years of professional experience in maternal health/obstetrics/paediatrics) as per recommendations made in PSE operational guidelines (GoI, 2013).

3.3. Sample size estimation

In order to detect a change from 10% at baseline to 50% at endline in students' MNH competency levels, at 0.05 significance, having 80% power and considering a design effect of 2.9, the required sample size was 58 students. We rounded it off to 60 for equally distributing it across 3 institutions (cluster size 20). In order to detect the difference for each type of school in each state, we sampled three ANM and three GNM institutions in each state. There were only three CoNs in the two states, so we included all three in our study. The number of faculty who met the inclusion criteria for the study were less (one to five per institution), hence all were included.
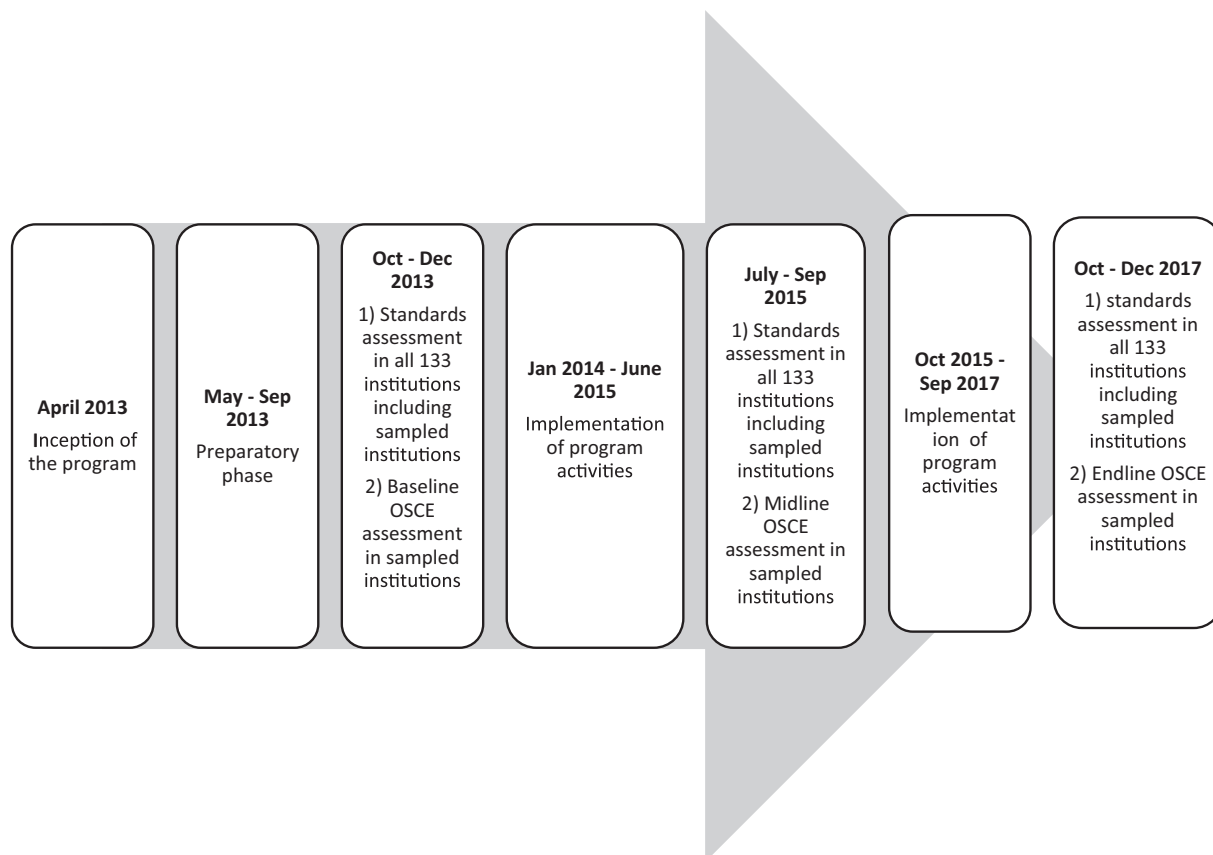

April 2013	May - Sep 2013	Oct - Dec 2013	Jan 2014 - June 2015	July - Sep 2015	Oct 2015 - Sep 2017	Oct - Dec 2017
Inception of the program	Preparatory phase	1) Standards assessment in all 133 institutions including sampled institutions 2) Baseline OSCE assessment in sampled institutions	Implementation of program activities	1) Standards assessment in all 133 institutions including sampled institutions 2) Midline OSCE assessment in sampled institutions	Implementation of program activities	1) standards assessment in all 133 institutions including sampled institutions 2) Endline OSCE assessment in sampled institutions

Fig. 2. Program implementation and evaluation timelines.

3.4. Sampling

A two-stage cluster sampling (Taherdoost, 2016) method was employed to select the study sites and participants. In the first stage, the required number of institutions were selected, and then the required number of students from each sampled institution were randomly selected. Institutions were selected to equally represent all three program divisions from each state. Hence, one institution of each type (i.e. ANM and GNM) from each program division was included from each state. Within a division, the ANM and GNM institutions were selected through simple random sampling. As there were only three CoNs in the two states, all three were included.

The average number of final year students enrolled per training institution was 60 for ANMs, 70 for GNMs and 72 for CoNs. We drew up a list of all eligible students at each institution and then randomly selected 20 to participate in the study. Additionally, we invited all eligible faculty to participate in the study.

3.5. Data collection tools and process

3.5.1. Assessment of institutional performance

Under the program, institutional performance was periodically assessed against predefined sets of performance standards developed for each institution type (GoI, 2013). The institutions which achieved at least 70% of these standards were considered as strengthened. The institutional assessments were jointly conducted by Jhpiego Program Officers and members of institution's administrative team. The latter were included in order to facilitate ownership of the program among them.

3.5.2. Assessment of knowledge and competences

The MNH related competences of study participants were assessed using the OSCE method. A standardized pre-tested OSCE checklist was developed in-line with latest GoI guidelines (GoI, 2015). In the past, we have used this approach for assessing level of MNH competences (knowledge and skills) among student nurse midwives in similar settings (Agrawal et al., 2016; Balasubramaniam et al., 2018). The OSCE covered six key MNH practices: 1) management of the second stage of labor (MSOL), 2) active management of the third stage of labor (AMTSL), 3) essential newborn care (ENBC), 4) newborn resuscitation (NBR), 5) plotting of partograph (PP) and 6) infection prevention (IP).

The first four practices were evaluated using simulation models and mannequins while the remaining two practices were assessed through administration of scenario based questions. On the day of the assessment, six separate stations were set-up, and each student was allowed to spend approximately 10 min at each station to perform a given skill. An observer scored the performance of participants against the set OSCE standards for each given practice. Prior to each round of data collection, a structured two-day training was provided to all observers (medical or nursing graduates) for standardizing clinical skills and providing an overview of study methodology and data collection tools. Additionally, inter observer reliability was ensured by employing the same group of standardized observers across all data collection points. Care was taken to ensure that students waiting to be assessed were not exposed to the OSCE stations beforehand. Faculty were assessed separately at the same OSCE stations. The maximum possible score was 76 points, and participants scoring at least 75% (57 points or higher) across all six OSCE stations were considered competent.

Three different cohorts of students were assessed at baseline, midline and endline. The program implementation timeline and the inclusion criteria for the assessment made it unrealistic to assess the same cohort during each phase of data collection. Students who were assessed during baseline graduated soon after intervention was initiated, and hence for next phases of data collection, students from successive batches were selected. However, the faculty across all data collection points were the same. Post completion of each round of data collection, a day long capacity building training on key MNH skills was provided to all final year students and faculty by Jhpiego Program Officers, regardless of their performance in OSCE.

3.6. Statistical analysis

Data were analysed using the IBM SPSS Version 22 software package. The percentage of standards achieved by nursing midwifery institutions were calculated for each round of data collection. We conducted the test of normality (Shapiro–Wilk test) on the OSCE scores of each participant cohort (baseline, midline and endline) which confirmed its normal distribution ($p > 0.05$).

Mean OSCE scores and the proportion of participants found competent in key MNH practices were calculated and compared for statistical significance using the independent sample *t*-test and the Pearson's chi-square test, respectively. Linear regression analysis on total OSCE scores was conducted for students and faculty, adjusting for clustering by institutions, type of institution, presence of a skills lab, and performance standards achieved by respective institutions.

3.7. Ethical considerations

Approval to conduct this study was obtained from the Institutional Review Board (IRB) of the Johns Hopkins University. The permission was also obtained from University of Southampton Ethics and Research Governance Committee (UoS-ERGOII-44718), as part of the NIPI scientific writing project which involved analysis of evaluation data. An informed consent was obtained from all participants prior to OSCE assessments. No personal identifiers of any kind were collected from participants.

4. Results

The percentage of performance standards met by each institution type improved significantly from baseline to endline in both the states (Fig. 3). The ANM training institutions in Madhya Pradesh met 21% of standards at baseline on average, and it increased to 67% and 86% at midline and endline respectively. None of the 15 institutions met 70% standards during baseline performance assessment. This number improved to 2 and 13 at midline and endline respectively.

The OSCE assessments were carried out in 12 institutions at baseline; and in all 15 institutions at midline and end line across the two intervention states. During baseline we were not able to conduct assessment at sampled ANM training institutions of Odisha due to unavailability of eligible students. A total of 232, 295 and 298 students as well as 64, 62 and 63 faculty members participated in the baseline, midline and endline OSCE assessments respectively.

The mean OSCE scores of students increased significantly from baseline to midline and endline ($p < 0.001$) (Table 1). The overall mean OSCE score for students at baseline was 17.1 (SD: 8.0), which increased to 46.3 (SD: 15.0) at midline and 66.4 (SD: 8.0) at endline. The mean OSCE scores increased significantly for each of the six skills, with the greatest improvement observed in MSOL and least improvement observed for IP practices. While endline scores for most skills exceeded 75% of the maximum possible score (the cut-off for competency), the mean OSCE score for partograph plotting was less than 60%.

For faculty, the overall mean OSCE score increased significantly from 23.5 (SD: 14.3) at baseline to 54.5 (SD: 12.7) at midline and 71.1 (SD: 5.2) at endline ($p < 0.001$) (Table 2). The highest improvement was observed for AMTSL while the least improvement was observed for IP practices. Mean scores at endline exceeded 75% of the maximum possible score for all skills assessed.

None of the students (0/232) or faculty (0/64) assessed at baseline were competent (achieved the 75% threshold) in OSCE. At midline, 29% (85/295) students and 47% (29/62) faculty achieved competence, while at endline, 91% (271/298) students and 98% (62/63) faculty achieved
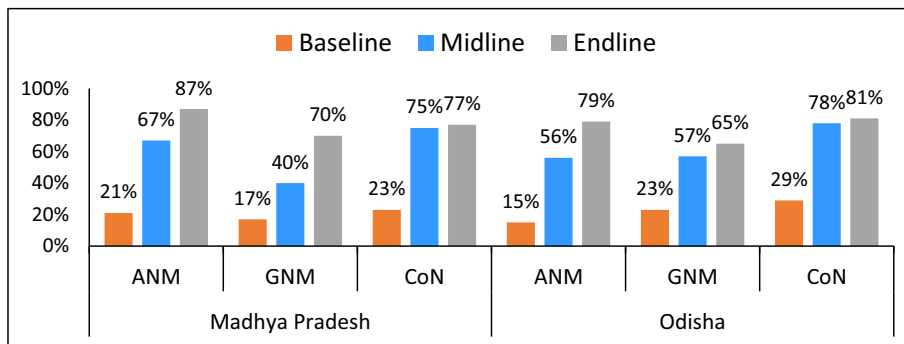
Fig. 3. Mean percent of institutional performance standards achieved, by state and type of institution. Auxiliary Nurse Midwifery (ANM). General Nurse Midwifery (GNM). College of Nursing (CoN).

Table 1
Mean student Objective Structured Clinical Examination (OSCE) scores, by skill and round of data collection.[a]

	Skill	Maximum possible score	Mean score (SD)			P-value for difference between:		
			Baseline cohort (*n* = 232)	Midline cohort (*n* = 295)	Endline cohort (*n* = 298)	Baseline and midline	Midline and endline	Baseline and endline
1	MSOL	12	1.27 (1.6)	7.15 (3.2)	11.29 (1.3)	<0.001	<0.001	<0.001
2	AMTSL	10	1.07 (1.4)	5.78 (3.2)	9.30 (1.4)	<0.001	<0.001	<0.001
3	ENBC	10	1.14 (1.7)	6.69 (2.6)	9.22 (1.2)	<0.001	<0.001	<0.001
4	NBR	12	1.86 (2.07)	6.13 (4.0)	10.81 (2.1)	<0.001	<0.001	<0.001
5	PP	12	1.49 (1.9)	3.01 (3.5)	7.15 (4.5)	<0.001	<0.001	<0.001
6	IP	20	10.29 (3.8)	17.54 (2.8)	18.68 (1.5)	<0.001	<0.001	<0.001
	Total score	76	17.12 (8.0)	46.30(15.0)	66.44 (8.0)	<0.001	<0.001	<0.001

Management of the second stage of labor (MSOL).
Active management of the third stage of labor (AMTSL).
Essential newborn care (ENBC).
Newborn resuscitation (NBR).
Plotting of partographs (PP).
Infection prevention (IP).
[a] Independent sample *t*-test.

Table 2
Mean faculty Objective Structured Clinical Examination (OSCE) scores, by skills and round of data collection.[a]

	Skill	Maximum possible score	Mean score (SD)			P-value for difference between:		
			Baseline (*n* = 64)	Midline (*n* = 62)	Endline (*n* = 63)	Baseline and midline	Midline and endline	Baseline and endline
1	MSOL	12	3.02 (2.6)	8.06 (2.9)	11.54 (0.6)	<0.001	<0.001	<0.001
2	AMTSL	10	2.0 (2.3)	7.42 (2.7)	9.56 (1.0)	<0.001	<0.001	<0.001
3	ENBC	10	2.86 (2.5)	7.52 (2.3)	9.54 (0.7)	<0.001	<0.001	<0.001
4	NBR	12	2.66 (2.7)	8.19 (3.6)	11.13 (1.5)	<0.001	<0.001	<0.001
5	PP	12	2.52 (2.8)	4.39 (4.1)	9.92 (3.3)	0.004	<0.001	<0.001
6	IP	20	10.45 (5.2)	18.89 (1.7)	19.40 (1.2)	<0.001	0.06	<0.001
	Total score	76	23.50 (14.3)	54.47 (12.7)	71.08 (5.2)	<0.001	<0.001	<0.001

Management of the second stage of labor (MSOL).
Active management of the third stage of labor (AMTSL).
Essential newborn care (ENBC).
Newborn resuscitation (NBR).
Plotting of partographs (PP).
Infection prevention (IP).
[a] Independent sample *t*-test.

the same; this difference was statistically significant (p < 0.001) (Fig. 4).

We also conducted a linear regression analysis on the total OSCE scores of both students and faculty, adjusting for clustering by institution, type of institution, performance standards achieved by institutions, and the presence of a skills lab (Table 3). The adjusted difference in total OSCE scores between baseline and midline was statistically significant for both students and faculty, as was the difference between midline and endline.

5. Discussion

We evaluated the effect of PSE strengthening program on institutional performance as well as MNH competences of nursing midwifery students and faculty using OSCE. The findings revealed a significant improvement in institutional performance as well as competences of students and faculty from baseline to endline. None of the institutions assessed met 70% standards at baseline. This improved to 87% (13/15) of institutions found strengthened at endline. Similarly, the mean OSCE
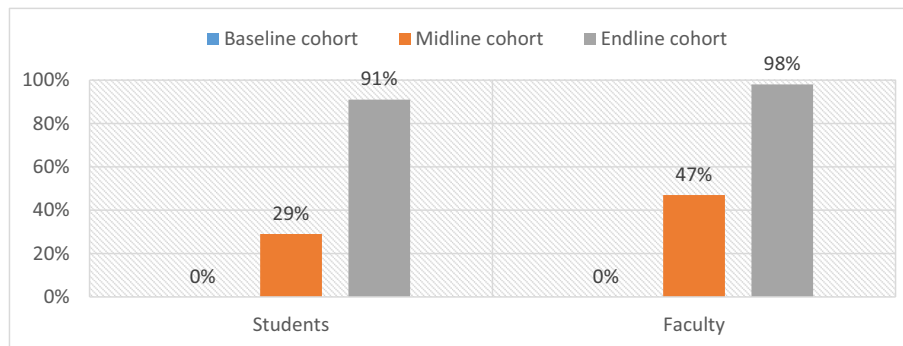
Fig. 4. Proportion of participants (students/faculty) found competent in OSCE (Pearson chi-square test).

Table 3
Estimates of linear regression on total Objective Structured Clinical Examination (OSCE) scores.

Difference in total OSCE score between	Adjusted[a] difference for students (95% CI)	Adjusted difference for faculty (95% CI)
Baseline and midline	19.21 (2.75–35.67)[b]	23.57 (9.72–37.41)[b]
Midline and end line	13.49 (3.38–23.60)[b]	12.30 (4.50–20.10)[b]

[a] After adjusting for clustering by institutions, type of institution, performance standards achieved by institution and presence of skills lab.
[b] $p < 0.05$.

scores for students and faculty, and their level of competences, improved significantly across all the six practices from baseline to endline.

The baseline findings of our evaluation were found consistent with studies conducted in the past which also confirmed suboptimal quality of pre-service training provided to nursing midwifery students in lower middle income countries (USAID, 2009; Yigzaw et al., 2015). The institutional performance and competences of faculty was very low at baseline, and this might be a key reason for low competences among students as well. These findings are in agreement with global evidences, which indicate that competences of faculty, educational resources and institutional environment are crucial for quality pre-service education (Fogarty et al., 2012; Johnson et al., 2013). The findings of our baseline assessments were also in-line with other contextual evidences which highlighted significant problems in nursing midwifery education in India and emphasized quality consideration of PSE as an urgent need for overall strengthening of nursing midwifery cadre (NHSRC, 2009; Rao et al., 2011).

Our PSE strengthening approach included the five most critical dimensions (Fig. 1) of the quality nurse midwifery training (GoI, 2013; WHO, 2010). The framework adopted within the intervention was derived from global evidences on essential components of PSE and conceptual model proposed to ensure production of a competent, confident and well-prepared nurse midwifery workforce (Fogarty et al., 2012; Johnson et al., 2013).

The comparative analysis of baseline, midline and endline data found that the combination of attributes included in the PSE intervention may have contributed to improvements in institutional performance as well as MNH competences of nursing midwifery students and faculty. A similar evaluation conducted in Mozambique found that strengthening pre-service training through revision in curriculum, faculty preparation and improved supervision was effective in improving knowledge and clinical skills among mid-level healthcare providers (Feldacker et al., 2015). The study also acknowledged the importance of clinical practice and post-training mentorship in improving quality of care provided by them.

In our evaluation, we found an uneven level of competency attainment among participants from baseline to endline for the identified

MNH skills. The greatest improvement was observed in mean scores for MSOL for students and AMTSL for faculty, while least improvements were observed in IP practices for both the groups. This might be due to an already high mean score at baseline.

Plotting of partograph was another practice which showed low scores at baseline and limited improvement between baseline and endline OSCE assessments. Although most skills exceeded the cut-off for competency ($\geq$75%) at endline, the mean student score for partograph plotting was less than 60%. This limited improvement in partograph plotting is also evident in some previous evaluations which we have conducted using similar methodology in different settings (Agrawal et al., 2016; Balasubramaniam et al., 2018). Based on our program implementation experiences, the likely reason behind this observation is limited hands-on practice on partograph use by students at clinical practice sites. The students during their clinical postings usually get enough exposure of other clinical practices under supervision of service providers posted at the labor rooms. But due to high patient load, HR shortage and sometimes unavailability, the use of partograph for monitoring labor progress is not a routine practice at the clinical sites. Similar reasons related with underutilization of partographs are also evident in the literature (Kushwah et al., 2013).

Our PSE strengthening intervention was effective in improving institutional performance of public sector nursing midwifery institutions but as the major share of India's health workforce comes from the private sector, it is essential to ensure optimal quality of education in private institutions as well. The public sector institutions contribute only 10% to the total nursing midwifery institutions of the country, and thus are insufficient to address the national nursing midwifery workforce shortage. According to INC, in 2016, the private institutions produced approximately 197,287 GNMs and B.Sc. graduates while government institutions produced merely 20,281 GNMs and B.Sc. graduates (INC, 2019). Hence, the capacity of these private institutions to produce competent and confident nurse midwifery workforce is extremely important for sustained improvements in MNH outcomes. Testing feasibility of implementation of PSE intervention in private sector institutions and generating evidences on its effectiveness is crucial and way forward towards nation's vision of achieving the universal health coverage.

One of the key determinants of the program success was adequate and timely disbursement of funds by GoI under PSE strengthening initiative. A huge amount of fund (approximately 3800 million USD) was leveraged by the GoI between 2013 and 2017 for successful implementation of PSE strengthening program across all public sector nursing midwifery institutions of Odisha, Madhya Pradesh, Bihar and Rajasthan (National Health Mission, 2019). These funds were used to upgrade physical infrastructure, hiring of human resources and setting-up of skills lab to facilitate competency based trainings of students at nursing midwifery institutions, without which achieving desired outcomes was not possible.

Although the findings of this intervention are promising, post

deployment follow-up and tracking of these students will be helpful in understanding the long-term impact of the program in improving standards of facility based care and, ultimately, on maternal and newborn outcomes.

6. Strength and limitations

To the best of our knowledge, our study is the first of its kind in India, which measured institutional performance and evaluated the effect of PSE strengthening program. The study utilized OSCE methodology for assessing the competences of students and faculty - which is a validated method for measuring competences and has been used in similar other studies across the globe (Smith et al., 2012). Additionally, we used publically available performance standards endorsed by GoI & INC to assess institutional performance. Therefore, the findings of our study are comparable with similar evaluations conducted elsewhere in India. (GoI, 2013).

Our study has few limitations as well. The cohort of students assessed at each time point were different and inherent differences in their background characteristics could have influenced their performance on OSCE. According to the approved research plan, the background characteristic (e.g. name, age, sex etc.) of participants were not recorded during data collection. Hence, characteristics of participants were not taken into account while conducting analytical modelling.

Secondly, selecting a comparison group was not feasible because of state-wide implementation of intervention across all public sector nursing midwifery institutions. Therefore secular trends, which could have had an influence on the outcome of interest, could not be accounted for.

7. Conclusion

The study findings suggest that the combination of attributes included in the PSE strengthening program in the Indian settings may have contributed to improvements in institutional performance as well as MNH related competences of nursing midwifery students and faculty over time. Based on the findings, scale-up with ongoing evaluation is warranted.

CRediT authorship contribution statement

NA, SB, AS, GU conceptualized and contributed to the results, discussion and conclusions sections. AG, HS, SM, RA contributed to the project implementation, drafting introduction, methodology sections. SK, SK, BS contributed to the intervention design, manuscript conceptualization, presenting the results to key policymakers and Ministry of Health and Family Welfare GoI. PS, AB contributed to the revision of the paper. All authors read and approved the final manuscript.

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Ethical considerations

Approval to conduct this study was obtained from the Institutional Review Board (IRB) of the Johns Hopkins University. The permission was also obtained from University of Southampton Ethics and Research Governance Committee (UoS-ERGOII-44718), as part of the NIPI scientific writing project which involved analysis of evaluation data. An informed consent was obtained from all participants prior to OSCE assessments. No personal identifiers of any kind were collected from participants.

Declaration of competing interest

None to declare.

Acknowledgements

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